

## ***Cylindrospermopsis raciborskii*: Another harmful exotic invader?**

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Cyanobacteria or blue-green algae possess characteristics of both bacteria and algae. Think of them as bacteria with photosynthetic properties. Cyanobacteria occur naturally in fresh and salt waters worldwide. Under conditions of excessive nutrient availability (primarily phosphorus), slow moving or stagnant water, and warmth, cyanobacteria may proliferate, producing surface scums, bottom mats, off-flavors, and, as they decompose, severe oxygen depletion. These “blooms” also have the potential to produce toxins that are harmful to humans and other animals. About 50 of the approximately 1500 species of cyanobacteria are thought to be capable of producing toxins, although even for these species the specific environmental conditions that lead to toxin production are often unknown.

Reported adverse health effects from cyanobacterial toxins include damage to the liver, nervous system, kidneys, gastrointestinal tract, respiratory tract, and skin. Human exposures described in the literature have occurred primarily through the intentional or unintentional ingestion of untreated water. Additional exposures have occurred through inhalation of water aerosols while swimming and through dermal contact. In 1996 in Brazil, more than 50 persons died when water containing a cyanobacterial toxin was used in their kidney dialysis machines. Animals drinking water containing toxins are also at risk of illness and death.

In August 2001, a contractor working for the Indiana Department of Natural Resources identified the cyanobacterium, *Cylindrospermopsis raciborskii*, in Ball Lake in Steuben County. This organism was thought to be primarily a tropical and sub-tropical species occurring in the United States only in the southeastern states. Because *Cylindrospermopsis* was known to be able to produce toxins, the Steuben County Health Department issued a health advisory against recreational use of Ball Lake until the water could be tested for the presence of toxins. Fortunately, only trace amounts of toxin were present at the time of sampling, and the health advisory was lifted. There were no reports of human or animal adverse health effects.

As a result of routine sampling in 2002, water company personnel found *Cylindrospermopsis* organisms in some of the reservoirs supplying water to the Indianapolis metropolitan area. Although organisms were present in untreated water away from intakes, none were found in samples collected at the intakes. Again, there were no reports of human or animal adverse health effects.

### **What are some of the public health implications of *Cylindrospermopsis* for Indiana?**

- *Cylindrospermopsis* will probably be found in Indiana lakes from now on. Detection will depend on environmental conditions, season, and which lakes are sampled. *Cylindrospermopsis* tends not to form scums but rather dense bands below the surface.
- *Cylindrospermopsis* organisms can be identified by microscopic examination of water. Identification of the toxin requires concentration of water samples with subsequent animal inoculation or mass-spectrometry. Only a few laboratories in the country are able to measure toxin, and the cost per sample is high.

- The presence of other, non-toxic algal blooms will create public anxiety about health risks. Many of these blooms are unsightly and odorous. It will be important to be able to distinguish *Cylindrospermopsis* (and other potentially toxic) blooms from the merely esthetically unpleasant ones.
- The presence of *Cylindrospermopsis* will require evaluation by public health agencies. Response will depend on the concentration of organisms, the presence of toxin, and potential for human exposure. At present, there are no funds specifically earmarked for toxin testing.
- The lack of official standards for safe levels of *Cylindrospermopsis* toxin complicates the public health response. The specific environmental conditions, which lead to toxin production, are not well characterized. Thus the mere presence of organisms does not necessarily mean that toxin is present in significant amounts. Chemicals, such as copper sulfate, which destroy algal cells, can actually cause an immediate increase in free toxin.
- Treatment of lake water for human consumption can greatly reduce the toxin levels. Thus, the greatest public health concern is from recreational use of contaminated waters. Eating fish from affected lakes is safe because the toxin does not appear to bioaccumulate in fish.
- It is not known how *Cylindrospermopsis* was transported to Indiana waters. Some possible routes include mechanical transfer via the surfaces of boats or waterfowl, emptying live bait waters from endemic areas into Indiana lakes, and wind carriage.
- Since there are no established standards and no apparent adverse health effects in Indiana, there are no plans to conduct *Cylindrospermopsis* surveillance for public health purposes.
- Algal blooms of all types can be reduced by limiting the amount of nutrients entering Indiana lakes. Common sources of nutrients include agricultural sources (animal wastes and fertilizers), lawn fertilizers, and failed septic systems.
- Although human and animal adverse health effects attributable to *Cylindrospermopsis* have been described in other locations, no such events have been reported in Indiana. At this time, the likelihood of injury due to exposure to affected waters is unknown but certainly a possibility.

Bottom line? *Cylindrospermopsis* health concerns will be with us for the foreseeable future. Despite the lack of clear standards for hazardous levels of organisms or toxin, future reports of *Cylindrospermopsis* in Indiana waters will necessitate a public health response. ISDH will work with local health departments and other agencies in crafting an appropriate response for each specific situation.

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